CLAIMS

1. Method for the treatment of hair, comprising

 - applying a composition onto hair, wherein the
   composition comprises at least one active agent,
   selected among compounds, which are, alone or in
   combination with further compounds, capable, after
   application to hair and after the carrying out of the
   treatment of hair described in the following, to
   provide a shape memory effect;

 - previously, at the same time or subsequent to the
   application of the composition, bringing the hair
   into a desired shape (permanent memory shape) and

 - fixing the memory shape subsequently by inducing a
   chemical or physical change of the applied agents;

wherein, after a desired or undesired deformation of the memory
shape, the initial memory shape can be substantially recovered
by means of a physical stimulation.

2. Method for hair treatmentaccording to claim 1, wherein

 - the composition co mprises at least one cross -linkable
   macromer, which forms after crosslinking a shape -memory
   polymer, wherein the macromer

   a) comprises cross -linkable segments, which are
   cross-linkable by means of chemical bonds, and

b) thermoplastic segments, which are not chem ically

cross-linkable,

- wherein the fixing the memory shape is achieved by

means of chemical cross -linking of the macromer in

5   order to form the shape-memory polymer, and

wherein the shape -memory polymer possesses at least one

transition temperature T_{trans}.

3. Method for hair treatment, wherein

10   - a hairdo (permanent shape) programmed in accordance

with the method according to claim 1 or claim 2 is

heated to a temperature above T_{trans},

- the hair is brought into a second (temporary) shape,

and

15   - the second shape i s fixed by means of cooling to a

temperature below T_{trans}.

4. Method in accordance with any of the preceeding claims,

20   wherein the cross -linkable macromer is selected among

compounds having the general formula

$$A1-(X)_n-A2 \ (I)$$
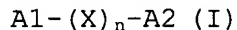
Wherein A1 and A2 represent a reactive, chemically cross -

linkable group and wherein $-(X)_n-$ represents a divalent,

25   thermoplastic polymer segment or oligomer segment.

5.   Method according to claim 4, wherein the cross -linkable macromer is selected from polyesters, oligoesters, polyalkylene-glycols, oligoalkylene -glycols, polyalkylene carbonates and oligoalkylene carbonates substituted with at least two acrylate groups or methacrylate groups.

6.   Method in accordance with claim 5, wherein the cross - linkable macromer is selected among pol y(ε-caprolactone)- dimethacrylate, poly(DL -lactide)-dimethacrylate, poly(L - lactide-co-glycolide)-dimethacrylate, poly(ethylene - glycol)dimethacrylate, poly(propylene - glycol)dimethacrylate, PEG -block-PPG-block-PEG- dimethacrylate, poly(ethyleneadipate) -dimethacrylate and hexamethylenecarbonatedimethacrylate.

7.   Method in accordance with any of the preceding claims, wherein the composition comprises in addition a macromer having only one chemically reactive group, provided at the terminal or at a side chain.

8.   Method in accordance with claim 7, characterized in that the additional macromer is selected among compounds of the following general formula

$$R-(X')_n-A3$$
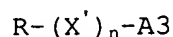
wherein R represents a monovalent organic residue, A3 represents a reactive, chemically cross -linkable group and

wherein $-(X')_n-$ represents a divalent, thermoplastic polymer segment or oligomer segment.

9.   Method in accordance with claim 8, wherein the additional macromer is selected among polyalkylene   -glycols substituted with one acrylate group or met hacrylate group and monoalkylethers thereof as well as block copolymers thereof.

10.Method in accordance with claim 9, wherein the additional macromer substituted with only one chemically reactive group is selected among poly(ethylene   -glycols)monoacrylate, p oly(propylene-glycol)monoacrylate and monalkylethers thereof.

11.   Method in accordance with claim 1, wherein the composition comprises at least to active agents, which alone show no or only weak shape memory properties, but which, after combined applicati on to hair provide a synergistically increased shape memory effect.

12.   Method according to claim 1, wherein the composition comprises at least one shape memory polymer, which comprises

a) at least one hard segment which can be crosslinked by means of phys ical interactions, having a first transition temperature T'_{trans}, which lies above room

5 temperature, and

b) at least one soft segment having a second transition temperature T_{trans} which lies below T'_{trans}, and

wherein the memory shape is fixed by means of a p hysical

10 crosslinking of the shape memory polymers.

13. Method accordance to claim 12, wherein the shaping of the hairs occurs under warming to a temperature of at least T'_{trans} and wherein the subsequent fixation of the hairdo

15 occurs by means of cooling to a temperature below T'_{trans}.

14. Method for hair treatment, wherein

- a programmed hairdo (permanent shape) obtained in accordance with a method according to claims 12 or 13, is

20 warmed to a temperature between T'_{trans} and T_{trans},

- wherein the hair is th en brought into a second (temporary) shape and

- wherein the second shape is fixed by means of cooling to a temperature below T_{trans}.

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15. Method for reprogramming of a hairdo (permanent shape) obtained in accordance with the method according to claim 12 into a new permanent shape, wherein

- the is hairdo is warmed to a temperature above T'_{trans}
- followed by bringing the hair into a new shape and
- followed by fixing the new shape by means of cooling to a temperature below T'_{trans}.

16. Method in accordance with any of claims 12 to 15, characterized in that the shape memory polymer possesses a degree of crystallinity of from 3 to 80% and wherein the ratio of the moduli of elasticity below and above T_{trans} is at least 20.

17. Method according to any of claims 12 to 16 , characterized in that the shape memory polymer is a copolyester urethane.

18. Method according to claim 17, characterized in that the shape memory polymer is the reaction product of (a) two different macrodiols, selected among α,ω-dihydroxypolyesters, α,ω-dihydroxyoligoesters, α,ω-dihydroxypolylactones and α,ω-dihydroxyoligolactones, and (b) at least one diisocyanate.

19.   Method for the recovery of a programmed hairdo
       (permanent shape) obtained by one of the methods according
       to claims 1, 2, 11, 12 or 15, where   in the hairdo in a
       temporary shape according to claim 3 or claim 14 or in the
5   shape of a hairdo obtained by cold forming, is warmed to a
       temperature above T_{trans}.

20. Cosmetic composition, comprising in a cosmetically suitable
     medium at least one active agent, selected among compounds
10   which, alone or in combination with other compounds, are
     capable, after application to hair and carrying out the
     treatment according to any of claims 1 to 19, to provide a
     shape memory effect to hairs.

15 21. Cosmetic composition according to claim 20, wherein the
         active agent a macromer which is cross   -linkable to a
         shape-memory polymer, wherein the cross   -linked shape -
         memory polymer possesses at least one transition
         temperature T_{trans} and wherein the macromer comprises
20   a) cross-linkable segments which are cross   -linkable by
            means of chemical bonds, and
         b) thermoplastic segments, which are not chemically cross -
            linkable.

25   22. Cosmetic composition in accordance with claim 20,
              characterized in that the active agent is a shape

memory polymer, wh ich comprises at least one hard

segment with a first transition temperature T'_{trans},

which is crosslinkable by means of physical

interactions, wherein the first transition temperature

5   is above room temperature, and at least one soft

segment having a second transition temperature T_{trans},

which lies below T'_{trans}.

23.   Composition in accordance with claim 20 characterized in

10   that at least two active agents are contained, which alone

do not show shape memory properties or only weak shape

memory properties but which, after combined application

according to claim 1, provide the hair with a

synergistically increase shape memory effect.

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24.   Composition in accordance with any of claims 20 to 23,

characterized in that additionally 0.01 to 25 wt. -% of at

least one active agent are contained, selected among hair

cosmetics, hair fixatives and hair colorants.

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25.   Cosmetic composition in accordance with any of claims 20

to 24, characterized in that it is provided in the form of

a lotion, a spray lotion, a cream, a gel, a foam gel, an

aerosol spray, a non -aerosol spray, an aerosol foam, a

25   non-aerosol foam, a O/W -emulsion or W/O -emulsion, a macro

emulsion or a hair wax.

26. Use of macromers which are cross -linkable to shape -memory polymers for the treatment of hair, wherei n the macromer comprises

5   a) cross-linkable segments, which are cross   -linkable by means of chemical bonds, and

b) thermoplastic segments, which are not chemically cross - linkable,

wherein the shape -memory polymers do possess at least one

10   transition temperature T_{trans}.

27.   Use of a physically crosslinkable shape memory polymer for hair treatment, wherein the shape memory polymer comprises at least one hard segment with a first transition temperature

15 T'_{trans}, which is crosslinkable by means of physical interactions, wherein the first transition temperature is above room temperature, and at least one soft segment having a second transition temperature T_{trans}, which lies below T'_{trans}.